

Application No. 10/692,401
Amendment dated July 11, 2007
Reply to Office Action of April 11, 2007

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Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method of providing a unidirectional flow valve comprising:

folding a first portion of a vein longitudinally over an adjacent second portion of the vein; and

engaging at least two opposing areas of the second portion of the vein to adjacent areas of the first portion of the vein with at least one support device, wherein at least two opposing walls of the second portion of the vein define the unidirectional flow valve.

2. (Currently Amended) The method of claim 1, wherein folding the first portion of the vein includes:

isolating the second portion of the vein;

collapsing the second portion of the vein;

inserting a first support device into the first portion of the vein adjacent to the second portion of the vein, the first support device including a substantially hollow tubular member with a flow path therethrough;

inserting a second support device in a partially expanded state in the collapsed second portion of the vein, at least two portions of the second support device engaging the at least two opposing areas of the second portion of the vein;

folding the first portion of the vein longitudinally over the second portion of the vein by advancing the second support device in the partially expanded state and

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by association the at least two opposing areas of the second portion of the vein through the flow path of the first support device; and

expanding the second support device to a fully expanded state, where in the fully expanded state the at least two portions of the second support device bias the at least two opposing areas of the second portion of the vein against the adjacent areas of the first portion of the vein.

3. (Original) The method of claim 2, wherein the first support device includes a stent.

4. (Original) The method of claim 3, wherein the first support device is at least partially constructed from at least one shape memory material.

5. (Original) The method of claim 3, wherein the first support device is balloon expandable.

6. (Original) The method of claim 2, wherein the second support device includes a saddle.

7. (Original) The method of claim 6, wherein the saddle includes at least one substantially ring-like member having a reduced configuration, a partially expanded configuration and a fully expanded configuration.

8. (Original) The method of claim 2, wherein isolating the second portion of the vein includes:

advancing a catheter through the vein to a position under the second portion of the vein, the catheter including a catheter shaft, a first balloon, and a second balloon, the first balloon being positioned adjacent to a first end of the second portion of the vein and the second balloon being positioned adjacent to second end of the second portion of the vein; and

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inflating the first balloon and the second balloon.

9. (Original) The method of claim 8 wherein the catheter shaft defines an evacuation port and an evacuation lumen, and wherein collapsing the second portion of the vein includes evacuating the second portion of the vein after isolating the second portion of the vein by expanding the first balloon and the second balloon.

10. (Original) The method of claim 2, wherein collapsing the second portion of the vein includes:

separating at least the second portion of the vein from surrounding tissue;
and

evacuating the isolated second portion of the vein.

11. (Original) The method of claim 10, further including inserting a third support device through the vein and around at least the second portion of the vein.

12. (Withdrawn) An apparatus comprising:

at least one support device defining a first biasing surface and a second biasing surface, the first biasing surface constructed and arranged to engage a first area of an inner portion of a folded region of a vein against an adjacent area of an outer portion of the folded region of the vein, the second biasing surface constructed and arranged to engage a second area of the inner portion of the folded region of the vein against an adjacent area of the outer portion of the folded region of the vein for maintaining the folded region of the vein in a folded configuration in order to allow the inner portion of the folded region to act as a unidirectional valve.

13. (Withdrawn) The apparatus of claim 12, wherein the at least one support device includes at least one substantially ring like member.

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14. (Withdrawn) The apparatus of claim 12 wherein the at least one support device further includes a stent, wherein the stent provides the folded region of the vein.

15. (Withdrawn) The apparatus of claim 14, wherein the stent provides support for the outer portion of the folded region of the vein.

16. (Withdrawn) The apparatus of claim 14, wherein the at least one support device further includes a helical member adapted to be passed around the vein to limit expansion of the vein.

17. (Previously Presented) A catheter for use in forming a unidirectional valve in a vein, the catheter comprising:

a catheter shaft;
at least two expandable balloons positioned on the catheter shaft;
an expandable support member, the expandable support member being disposed about one of the balloons in a reduced state, the expandable support member being expandable from the reduced state to an expanded state; and
an expandable saddle member, the expandable saddle member including a first biasing region, a second biasing region and at least one end region, the expandable saddle member having a reduced state, a partially expanded state and a fully expanded state, where in the reduced state for the expandable saddle member the first biasing region, the second biasing region and at least one end region are engaged to the catheter shaft, in the partially expanded state the first biasing region and the second biasing region are free to expand radially outward from the catheter shaft but the at least one end region remains engaged to the catheter shaft, and in the fully expanded state the first biasing region, the second biasing region and the at least one end region are all free to expand radially outward from the catheter shaft.

18. (Canceled)

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19. (Original) The catheter of claim 17, wherein the catheter shaft defines an evacuation port and an evacuation lumen in fluid communication therewith, the evacuation port being positioned between the at least two expandable balloons.
20. (Original) The catheter of claim 17, wherein the catheter further includes an injection device extending along the catheter shaft and is constructed and arranged to be advance through a vein wall to deposit injection material about a selected portion of the vein.
21. (Previously Presented) The catheter of claim 20, wherein the injection material is selected from at least one member of the group consisting of: saline, contrast medium, anesthetic solution, air, carbon dioxide, and any combination thereof.
22. (Original) The catheter of claim 17, wherein the expanded support member includes a stent.
23. (Original) The catheter of claim 17, further including a helical member disposed within a lumen of the catheter shaft, wherein the helical member deploys from the lumen and limits the expansion of the expandable support member.